Indian J Phys 80 (10), 1017-1019 (2006)

Note

A statistical approach on measuring atmospheric noise and lightning activity at two stations of same latitudinal belt

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Received 4 July 2006, accepted 21 August 2006

Atmospheric noise at Kalyani in India originated from lightning as electromagnetic radiation and cloud-to-ground lightning data recorded at Taiwan, both under the same latitude belt have been considered to investigate the characteristics of the lightning phenomena. Correlations of atmospheric radio noise field strength against thunderstorm occurrences for both daytime and nighttime exhibit a close trend for east, central and north zones in India. A comparison of monthly variations of +ve, -ve and total CG strokes for different years reveals that the negative strokes are primarily responsible for producing a particular characteristic variation over a zone. Finally, future work on source activity are focused.

Lightning, atmospherics, source activity

92.60.Pw, 52.80.Mg, 92.60.Qx

Round-the-clock recordings of atmospheric radio noise have been made at many stations for studying geophysical aspects. Recordings provide valuable information on the radio noise of the basic problems of lightning [1-3]. Physical research lightning and the practical application of the results obtained closely connected to each other. Lightning discharges affect airlines, buildings, machines and telecommunication systems. They can cause damage to aircraft, they kill and injure living creatures and cause fires and accidents. All these have contribute to its extensive investigations in most of the civilized countries where lightning is a problem [4,5]. It is the purpose of the present paper to make a statistical approach on atmospheric noise and lightning activity at two stations situated on the same latitude belt.

Round-the-clock, Atmospheric Radio Noise Field Strengths (RNFS) are measured at Kalyani, West Bengal (Eastern India) at 27 KHz while cloud-to-ground lightning data are received over Taiwan. The map drawn in Figure 1 shows the observation sites of thunderstorm occurrences in India including the east

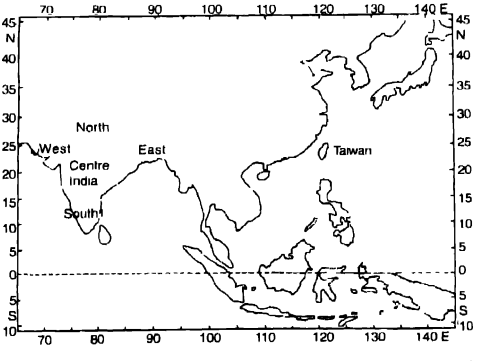

Figure 1. The two sites are under same latitude belt except the south zone of India which is varying by more than 10 degree compared to Taiwan.

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zone where Kalyani is situated, as well as the location of Taiwan Two sites are in the same latitude belt except the south zone of India which differs by more than 10 degree in latitude compared to Taiwan Location of the sensors used by lightning location system of Taiwan is shown in Figure 2 The system consists of (i) one advanced Position Analyzer (APA) and (ii) six Direction Finders (FD) installed in the sites covering the entire Taiwan area as shown in the figure Each direction finder detects cloud-to-ground lightning strikes and determines a direction towards a detected electromagnetic lightning discharge

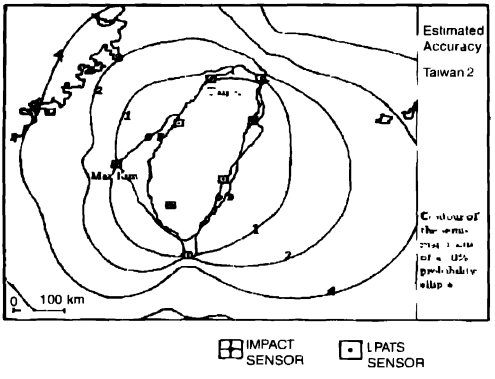


Figure 2 Location of the s used by lightning location system of Taiwan

The seasonal variations of ARNFS for 2- year period against thunderstorm occurrences, the three months average values of thunderstorm frequency and the corresponding values of ARNFS are plotted separately for daytime and nighttime as shown in Figure 3(a) and 3(b), respectively When thunderstorm data for the eastern region of India are compared with the seasonal variation of atmospherics, both thunderstorm data and atmospheric noise level exhibit highest values during summer and lowest values in winter The occurrence of thunderstorms

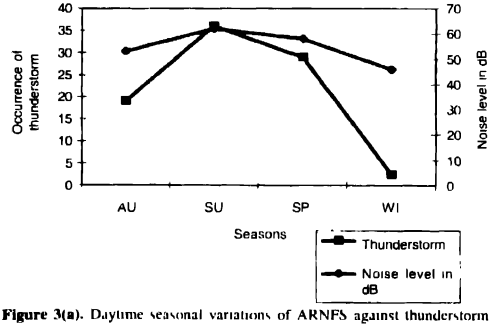


Figure 3(a). Daytime seasonal variations of ARNFS against thunderstorm occurrence

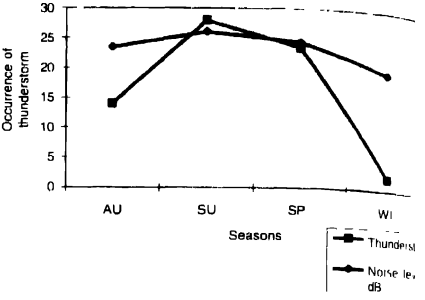


Figure 3(b) Nighttime seasonal variations of ARNFS against thunderst occurrence

in different zones corresponding to different seasons over I is shown along with seasonal variation of annual aver number of occurrences of CG lightning flashes over T (Figure 4) It is seen that during spring and summer month east zone exhibits highest value of annual occurrence thunderstorm days It further exhibits that highest value of strokes is found during summer while the lowest valu occurred during winter The curves of different zones of I when examined, reveal that for east, central and north z there is a close similarity in the trend but for the south zone variational pattern is highly dissimilar This may be due to latitudinal difference for that zone When west zone is ta into consideration, the variation is found to be not so promi owing to rare occurrences of thunderstorm in that zone

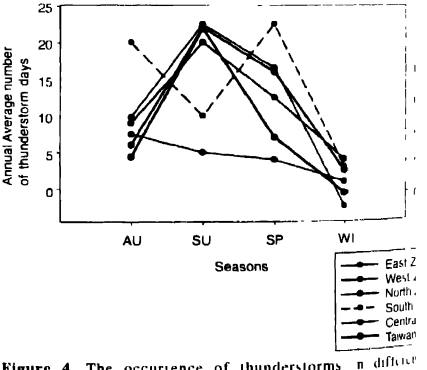
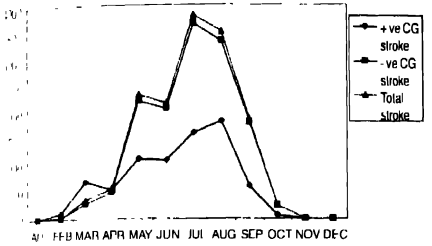


Figure 4. The occurrence of thunderstorms in differe corresponding to different seasons over India along with seasonal of annual average number of occurrences of CG lightning flas Taiwan

The total number of lightning strokes recorded in differ months of the year in addition to both positive and negati strokes have been compared in Figure 5 The figure reveals th the variational pattern of total strokes is similar to that

ve strokes indicating that the contribution of negative ning occurrences is greater than that of positive rences Due to large occurrences of negative strokes pective of the months, the characteristic variations of two s as observed in positive strokes has particularly no ibution in the characteristics of the total strokes This shing out effect of positive CG strokes indicate clearly that egative strokes are mainly responsible for producing a teristic variation over a zone



Comparison of monthly variations of +ve -ve and total CG

Our critical analysis of both +ve and –ve CS strokes indicate the negative strokes are largely responsible to produce a istic variation in the atmospheric noise over a zone

The present study should be supplemented by comparing MDFS (Magnetic Direction Finding System) and LPATS (Lightning Position and Tracking System) data [6] for a real thunderstorm in different zones of India which may provide better information and confirm locational accuracy and detection efficiency of the two systems Doppler Radar data must also be combined at such times to get additional information

Acknowledgments

The authors are thankful to the India Meteorological Department for supplying some relevant meteorological data One of the authors (S K Kar) likes to express his sincere thanks to the Govt of India for awarding him a post-doc fellowship to work at Taiwan

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